

## CLAIMS

1. A process for preparing carbohydrate fatty-acid esters  
5 comprising the steps of:

- (a) reacting acylated carbohydrate with free fatty acid in the presence of an acid catalyst, under reduced pressure;
- (b) decolorizing and separating out the unreacted fatty acid, from the reaction mixture obtained in step (a);

10 (c) precipitating out the unreacted acylated carbohydrate from the reaction mixture obtained in step (b); and

- (d) recovering carbohydrate fatty ester from the reaction mixture obtained in step (c).

15 2. The process of preparing carbohydrate fatty-acid esters of Claim 1, wherein in step (a), no solvent is added thereto.

3. The process of preparing carbohydrate fatty-acid esters of claim 1, wherein in the unreacted fatty-acid in the reaction mixture in step (b)  
20 is removed by precipitation from a solvent mixture at controlled temperature.

4. The process of preparing carbohydrate fatty-acid esters of claim 1, wherein the unreacted fatty-acid in the reaction mixture in step (b) is  
25 removed from the reaction mixture by solvent extraction.

5. The process of preparing carbohydrate fatty acid ester of claim 1 wherein the unreacted acylated carbohydrate is precipitated out in step (c) by cooling the reaction mixture in step (b) to a temperature in the range of -4 to 10 degree C.

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6. The process of preparing carbohydrate fatty acid esters of claim 1, wherein the unreacted free fatty acids and the unreacted C2 or C3-acylated carbohydrate esters which are removed during purification steps (b) and (c) are recycled to the reactant mixture.

7. The process of preparing carbohydrate fatty-acid ester of claim 1 wherein step (a) is carried out at a pressure in the range of 4 – 20 Torr.

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8. The process of preparing carbohydrate fatty-acid ester of claim 1 wherein step (a) is carried out at a pressure in the range of 5-10 Torr.

20 9. The process of preparing carbohydrate fatty-acid esters of Claim 1, wherein mono-, di- and poly-fatty acid esters of C2- or C3-acylated carbohydrates of various HLB values are obtained.

25 10. The process of preparing carbohydrate fatty-acid esters of Claim 1, wherein the HLB values of the product carbohydrate fatty-acid esters are in the range of 1 to 10.

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11 The process of preparing carbohydrate fatty-acid esters of  
Claim 1, further comprising the steps of:-

(e) liberating free hydroxyl groups by partial hydrolysis of the C2- or  
C3-acylated carbohydrate fatty acid ester in the presence of an acid

5 catalyst for a predetermined period of time to obtain carbohydrate  
fatty acid ester having free hydroxyl groups of predetermined HLB  
values.

12. The process of preparing carbohydrate fatty acid esters of claim

10 11, wherein the HLB values of the product carbohydrate fatty-acid  
esters are in the range of 8 to 16.

13. The process of preparing carbohydrate fatty-acid esters of Claim

1, wherein step (a) is processed at a temperature ranging from 60 to

15 95 degree C.

14. A process of preparing carbohydrate fatty acid esters  
comprising the steps of:

(a) reacting acylated carbohydrate with free fatty acid in the  
20 presence of an acid catalyst, under reduced pressure;

(b) decolorizing and separating out the unreacted fatty acid, from the  
reaction mixture obtained in step (a);

(c) precipitating out the unreacted acylated carbohydrate from the  
reaction mixture obtained in step (a);

25 (d) removing the unreacted free fatty acids and carbohydrate  
esters of low molecular-weight carboxylic acids during purification,

and recycling the removed unreacted free fatty acids and carbohydrate esters to the starting reactant mixture; and

(e) liberating free hydroxyl groups by partial hydrolysis of the acylated carbohydrate fatty acid ester in the presence of an acid catalyst for a predetermined period of time to obtain carbohydrate fatty acid ester having free hydroxyl groups of predetermined HLB values.

15. Carbohydrate fatty-acid esters produced in accordance with the  
10 process of claim 1 or 14.

16. The process according to claims 1 or 14 wherein the reactant carbohydrates include the group consisting of partially or peracylated mono-, di- and tri-saccharides in which the monosaccharide units  
15 could be a furanosyl, pyranosyl or a C2-C6 open-chain structure.

17. The process according to claims 1, 14 or 16 wherein the acyl group in the reactant acylated carbohydrates is acetic or propanoic acyl group.

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18. The process according to claims 1 or 14 wherein, the acid catalysts includes sulphuric and camphorsulfonic acids, in the case of the monosaccharides; and boron trifluoride diethyl etherate, alkyl sulphonic acid polysiloxanes and tosylic acid, in the case of the di-  
25 and tri-saccharides.

19. The process according to claims 1 or 14 wherein the workup solvents includes ethanol, iso-propanol, n-propanol and ethyl acetate.

20. The process according to claims 4 wherein the extraction solvent  
5 is hexane

21. The process according to claims 1 or 14 wherein the reactant free fatty acids have C6-C22 chain-length, with zero, mono or di-unsaturations.

10 22. The process according to claims 11 or 14 wherein the hydrolysis acid catalyst is trifluoroacetic acid.

15 23. The process according to claims 11 or 14 wherein the partially hydrolysed carbohydrate fatty acid esters are further separated by stage cooling, at controlled temperature ranging from -15 to 10 degree C, according to their degree of acylation.